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MEMORANDUM FOR PRS (In-House Publication)

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SUBJECT: ~~Authorization~~ for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-211**
C.T. Liu (PRSM), C.W. Smith (Virgina Poly Inst.), "Near Tip Behavior in a Particulate Composite Material Under Constant Strain Rates Including Temperature and Thickness Effects"

10th International Conf. on Fracture **(Statement A)**
(Hawaii, 3-7 Dec 2001) (Deadline: 23 Nov 01)

NEAR TIP BEHAVIOR IN A PARTICULATE COMPOSITE MATERIAL UNDER CONSTANT STRAIN RATES INCLUDING TEMPERATURE AND THICKNESS EFFECTS

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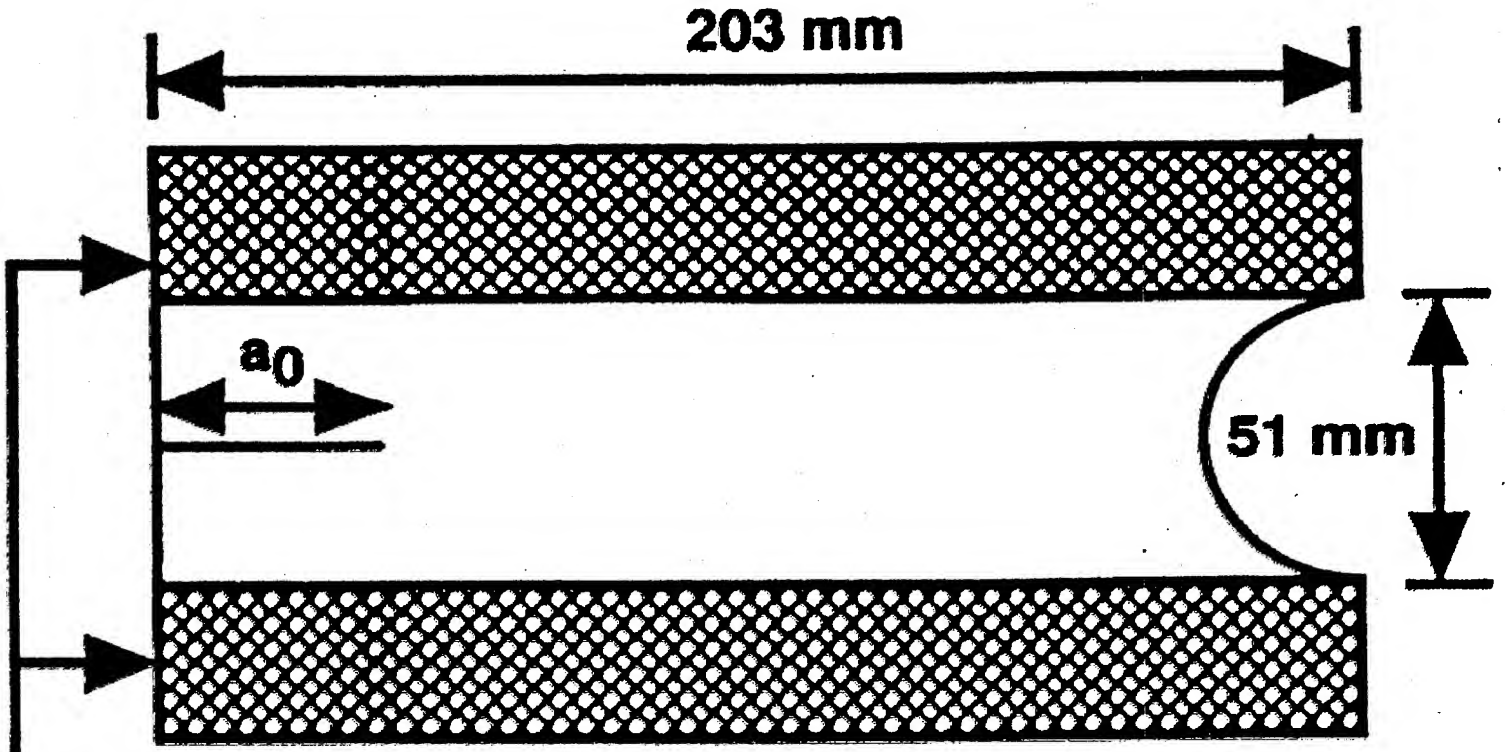
Objectives

- Investigate the Effects of Temperature and Specimen Thickness on Local Strain Fields and Crack Growth Behavior in a Particulate Composite Material.

- Temperatures: -53.9°C, 22.2°C, and 73.9°C

- Specimen Thickness': 2.54 mm and 12.7 mm

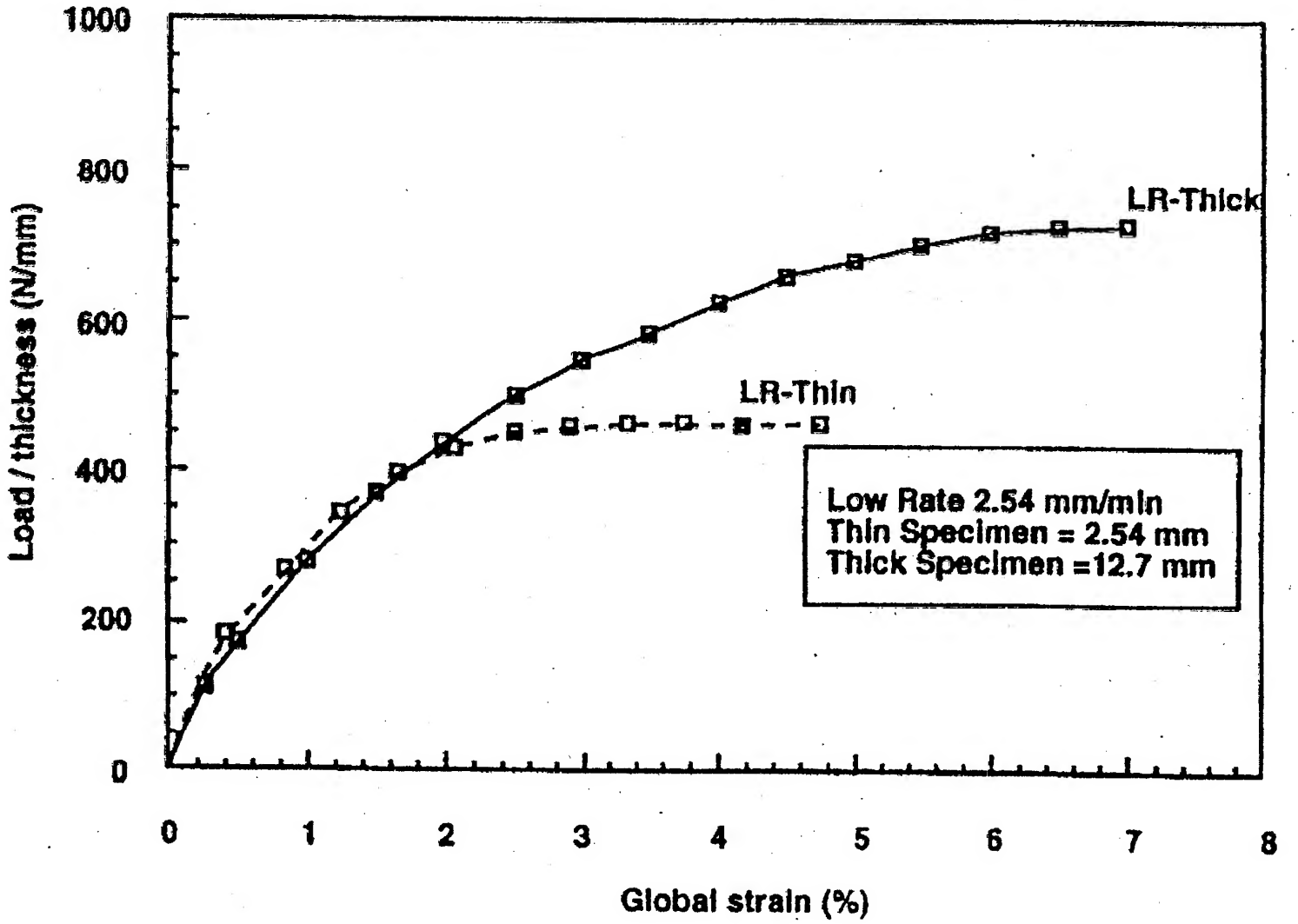
Specimen Geometry



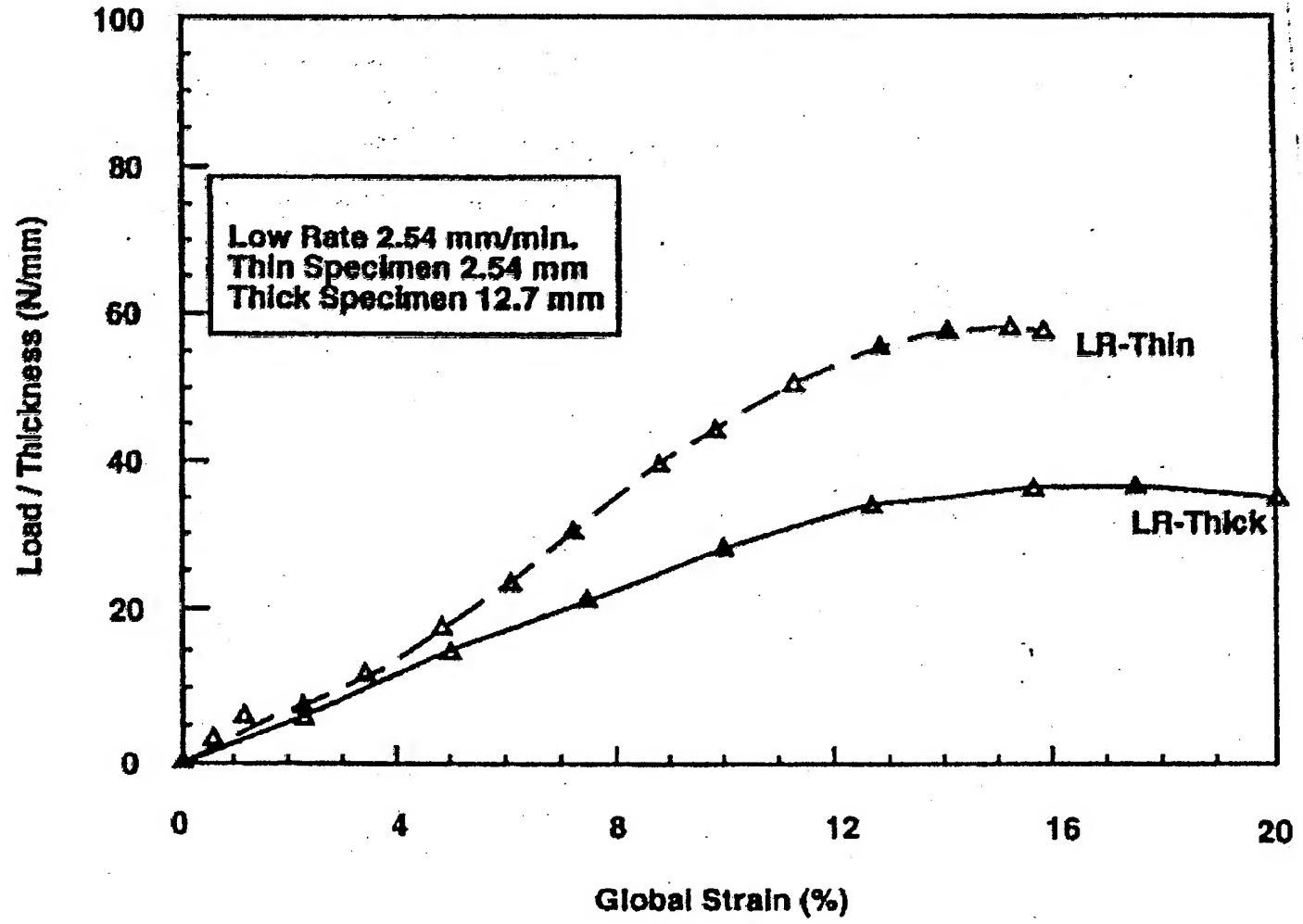
Aluminum grips cemented to specimen
Specimen thickness: 2.5 mm

a_0 = 23mm

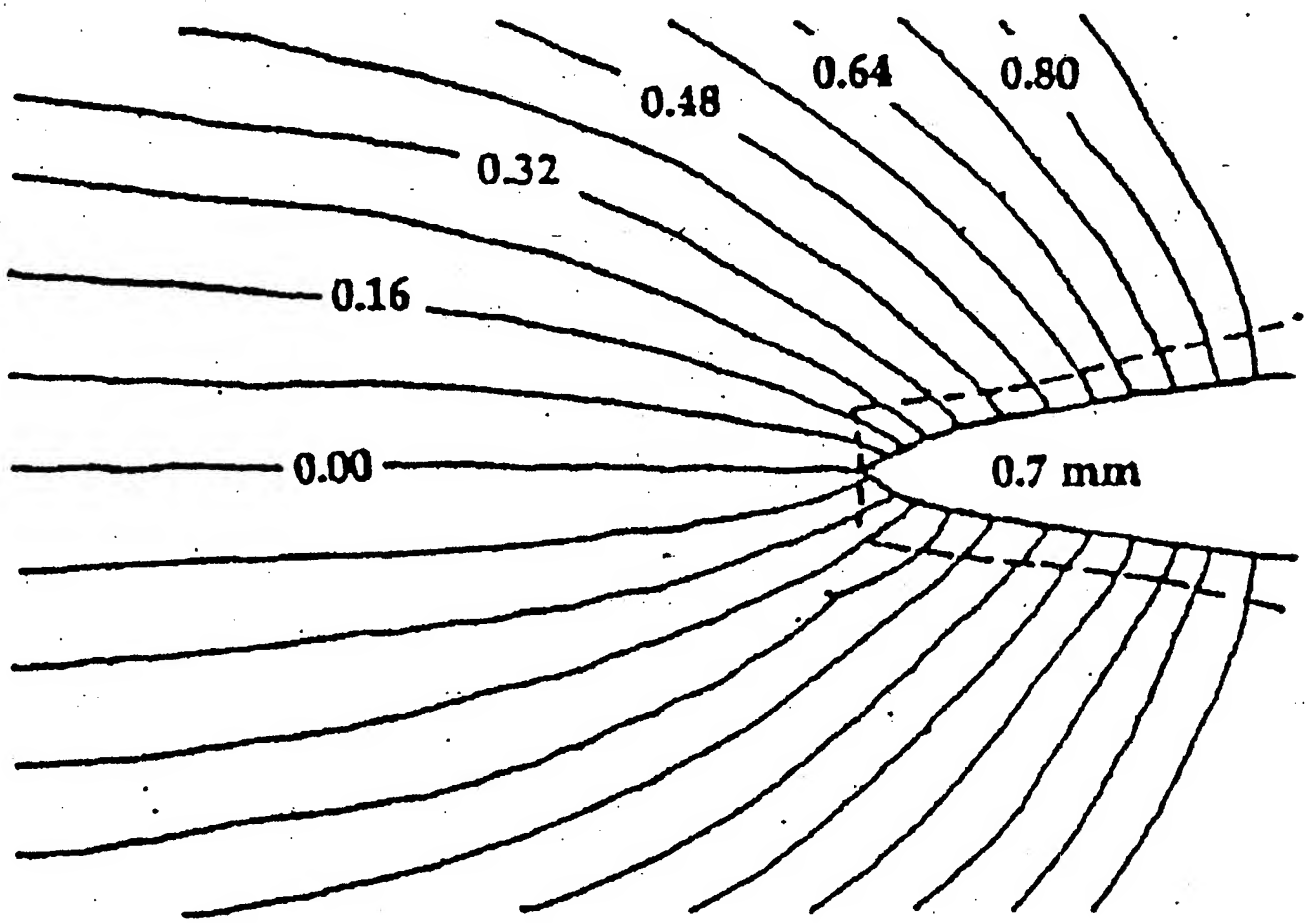
Load-Strain Relations (T=-53.9°C)



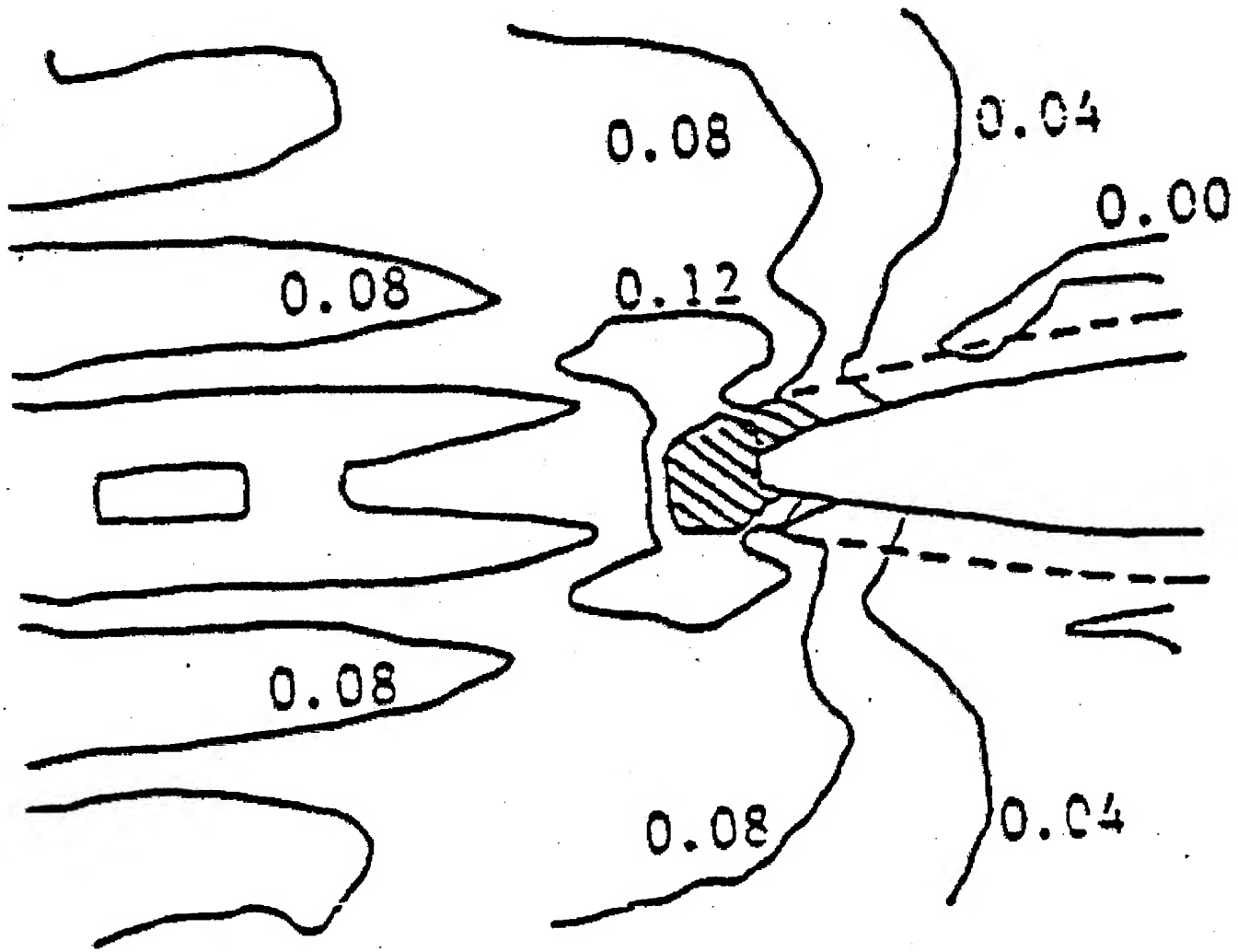
Load-Strain Relations (T=73.9°C)



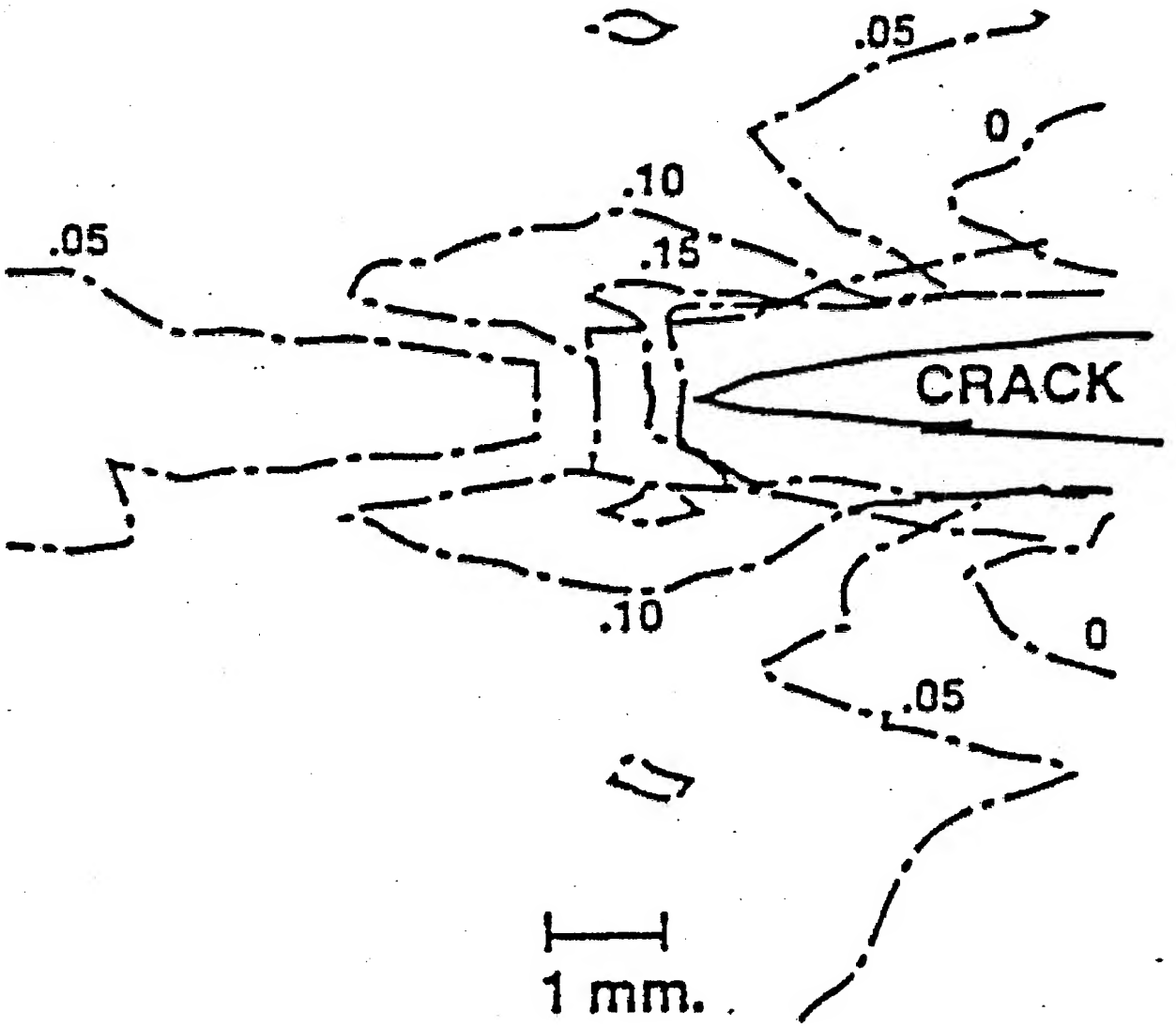
Typical Contour Plots of Normal Displacement (T=-53.9°C, t=2.54mm)



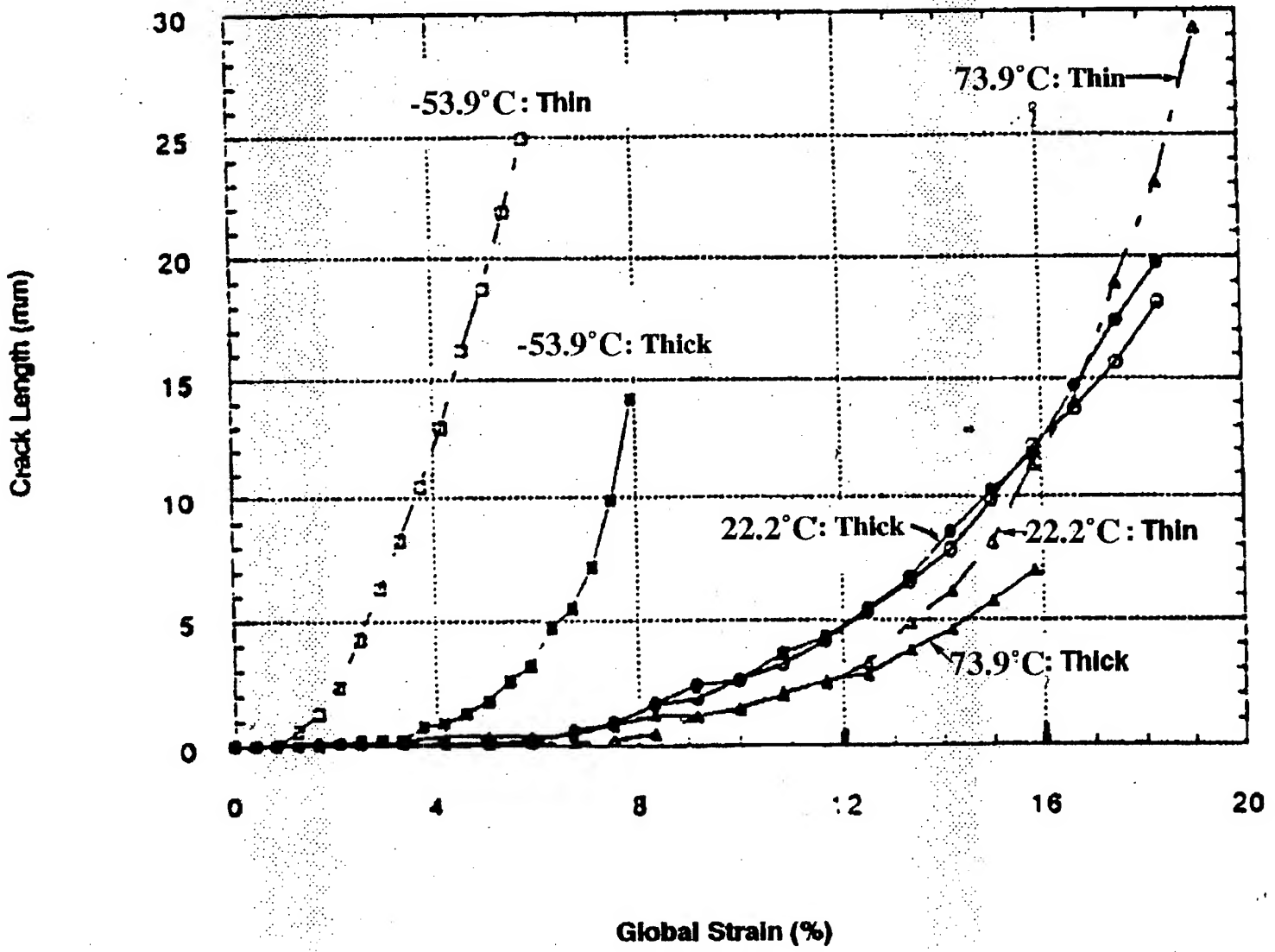
Thickness = 2.54mm



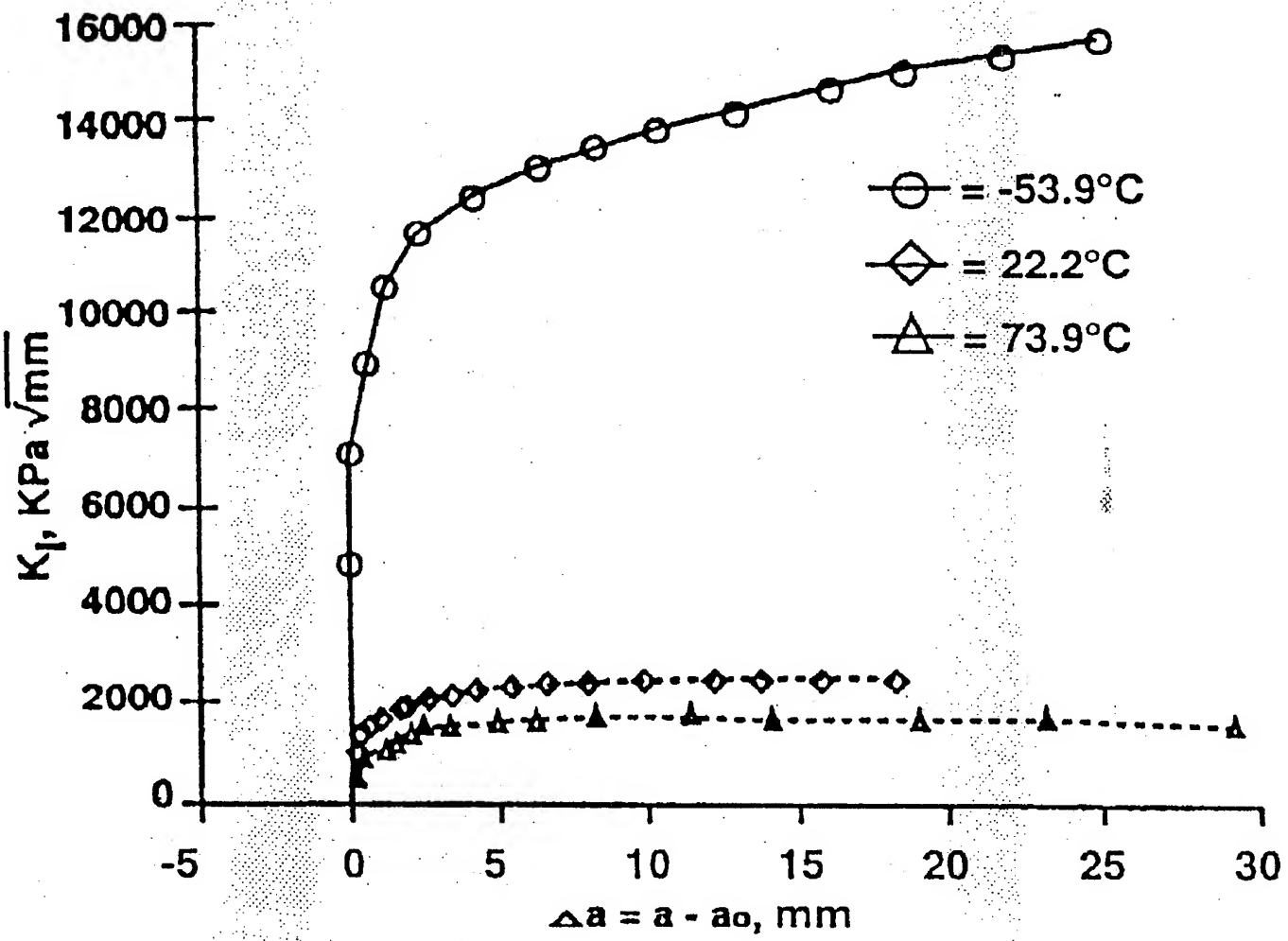
Thickness = 12.7mm



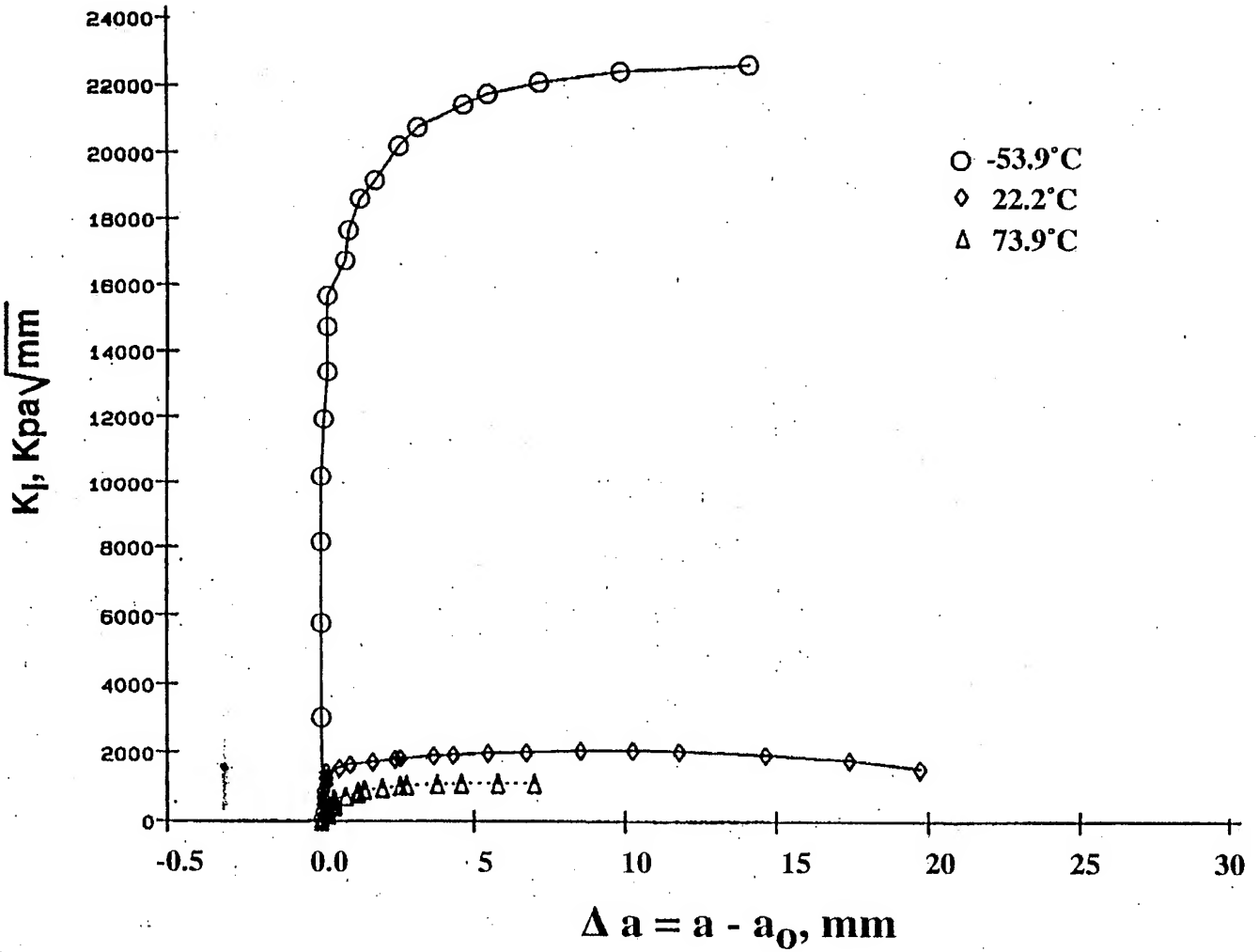
Crack Length (mm) Versus Global Strain (%)



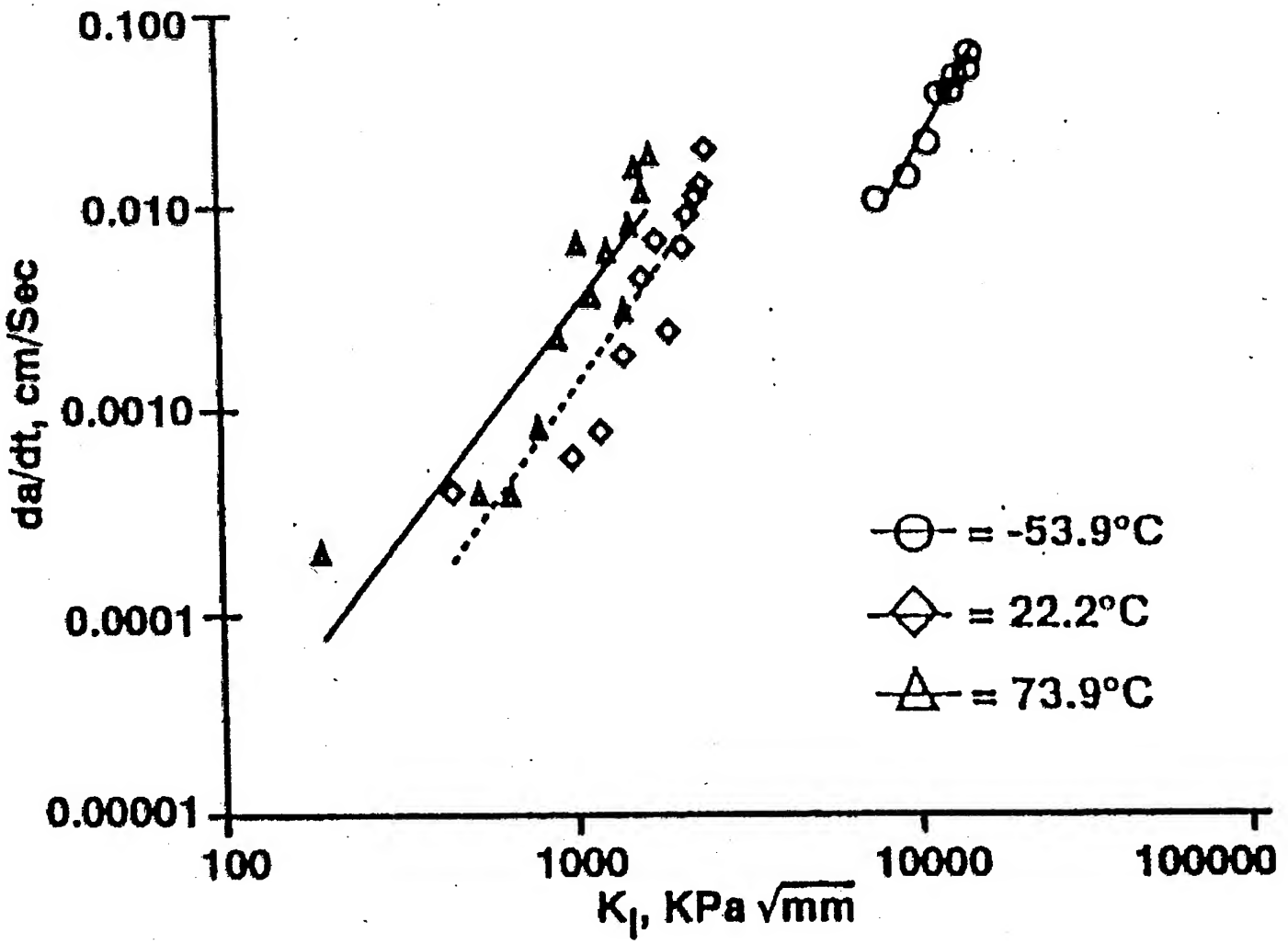
Crack Growth Resistance Curves (t=2.54mm)



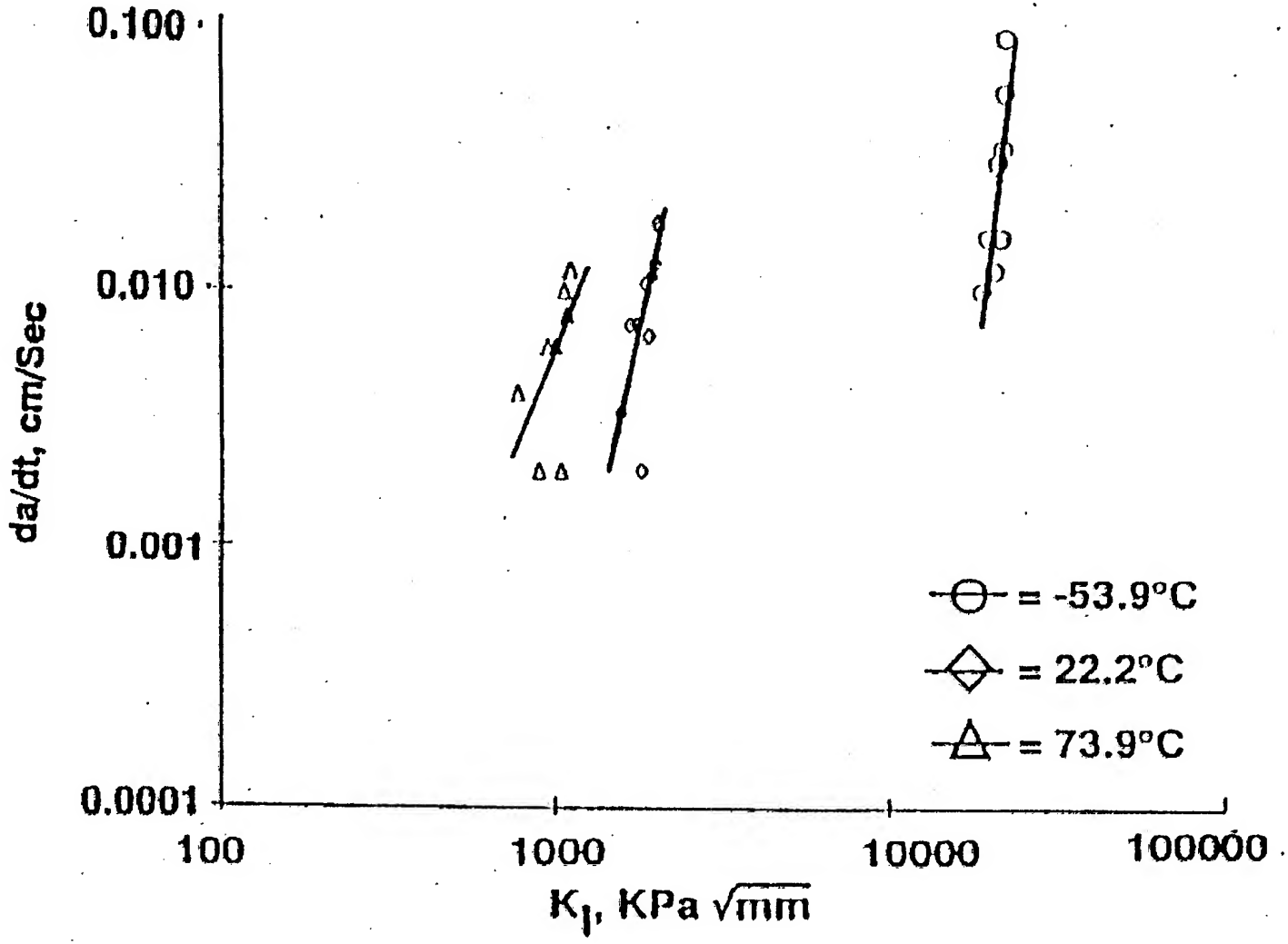
Crack Growth Resistance Curves (t=12.7mm)



Crack Growth Rate Versus Mode I Stress Intensity factor (t=2.54mm)



Crack Growth Rate Versus Mode I Stress Intensity factor (t=12.7mm)



Conclusions

This is an "observation". Can you draw some conclusion from it?

- The crack growth behavior at –53.9°C is significantly different from that at 22.2°C and 73.9°C.
- The increase in specimen thickness alters the local strain fields but the iso-strain contours are of the same general form.
- A power law relationship exists between the Mode I stress intensity factor and the crack growth rate.